

LEAD SCORE CASE STUDY

Sanket Singh Chauhan | Arnab Basu

PROBLEM STATEMENT

Introduction:

An education company, X Education sells online courses to industry professionals. The company markets its courses on various websites and search engines such as Google.

Once people land on the website, they might browse the courses or fill up a form for the course or watch some videos. When these people fill up a form providing their email address or phone number, they are classified to be a lead. Moreover, the company also gets leads through past referrals.

Once these leads are acquired, employees from the sales team start making calls, writing emails, etc. The typical lead conversion rate at X education is around 30%.

Business Goals:

The company wishes to identify the most potential leads, also known as "**Hot Leads**".

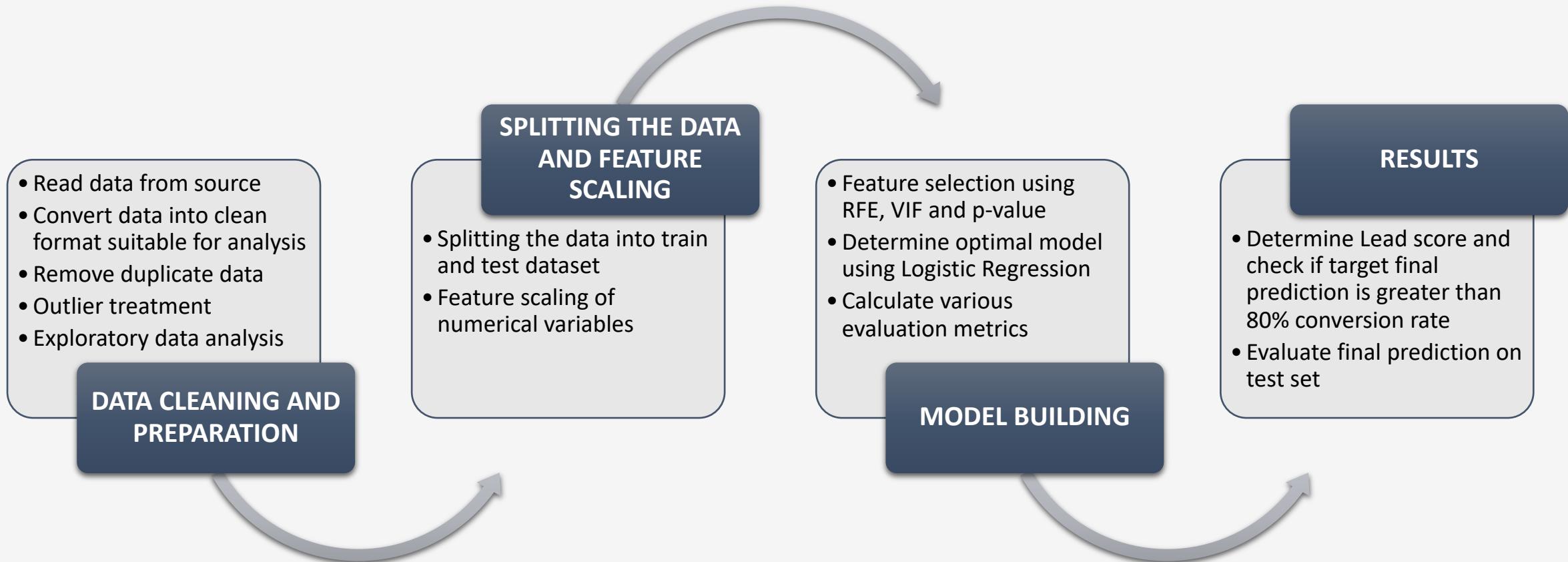
The company needs a model wherein a lead score is assigned to each of the leads such that the customer with higher lead score, have a higher conversion chance, and customer with lower lead score, have a lower conversion chance.

The CEO, in particular, has given a ballpark number for the lead conversion rate of 80%.

OVERALL APPROACH

1. DATA CLEANING AND IMPUTING MISSING VALUES
2. EXPLORATORY DATA ANALYSIS : UNIVARIATE , BIVARIATE and MULTIVARIATE ANALYSIS
3. FEATURE SCALING AND DUMMY VARIABLE CREATION
4. LOGISTIC REGRESSION MODEL BUILDING
5. MODEL EVALUATION : SPECIFICITY , SENSITIVITY, PRECISION and RECALL
6. CONCLUSION AND RECOMMENDATION

PROBLEM SOLVING METHODOLOGY



DATA CONVERSION

1. CONVERTING THE VARIABLE OF VALUES ‘YES/NO’ WITH ‘1/0’

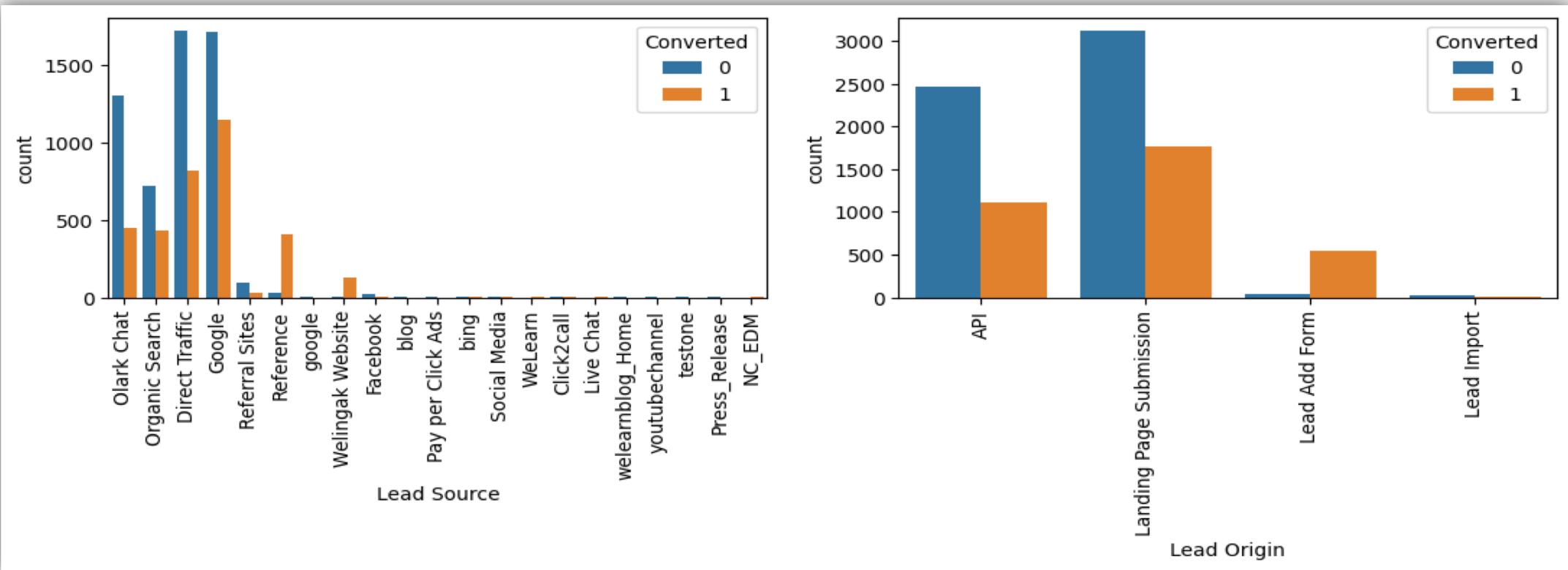
2. CONVERTING THE ‘SELECT’ VALUES WITH ‘NaNs’

3. DROPIING THE COLUMNS HAVING >70% OF NULL VALUES

4. DROPPING UNNECESSARY COLUMNS

5. DROPPING THE ROWS AS THE NULL VALUES WERE <2%

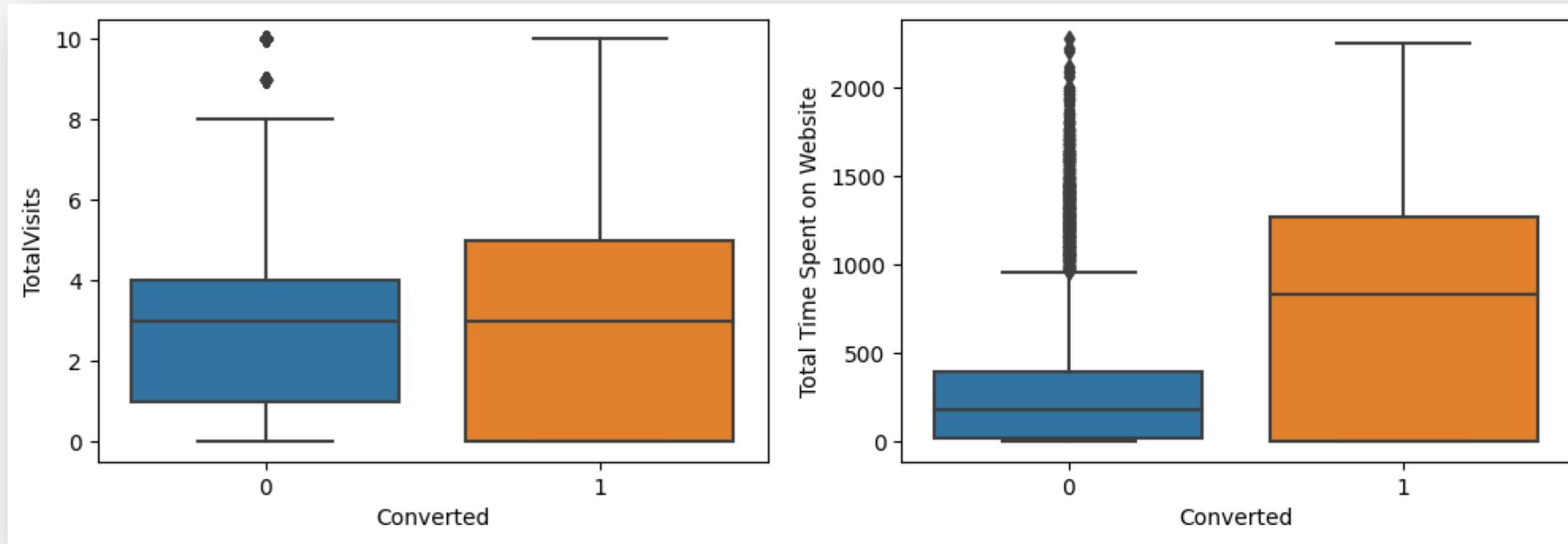
EXPLORATORY DATA ANALYSIS



OVERALL CONVERSION RATE – 30%

- The count of leads from the Google and Direct Traffic is maximum
- The conversion rate of the leads from Reference and Welingak Website is maximum
- API and Landing Page Submission has less conversion rate(~30%) but counts of the leads from them are considerable
- The count of leads from the Lead Add Form is pretty low but the conversion rate is very high

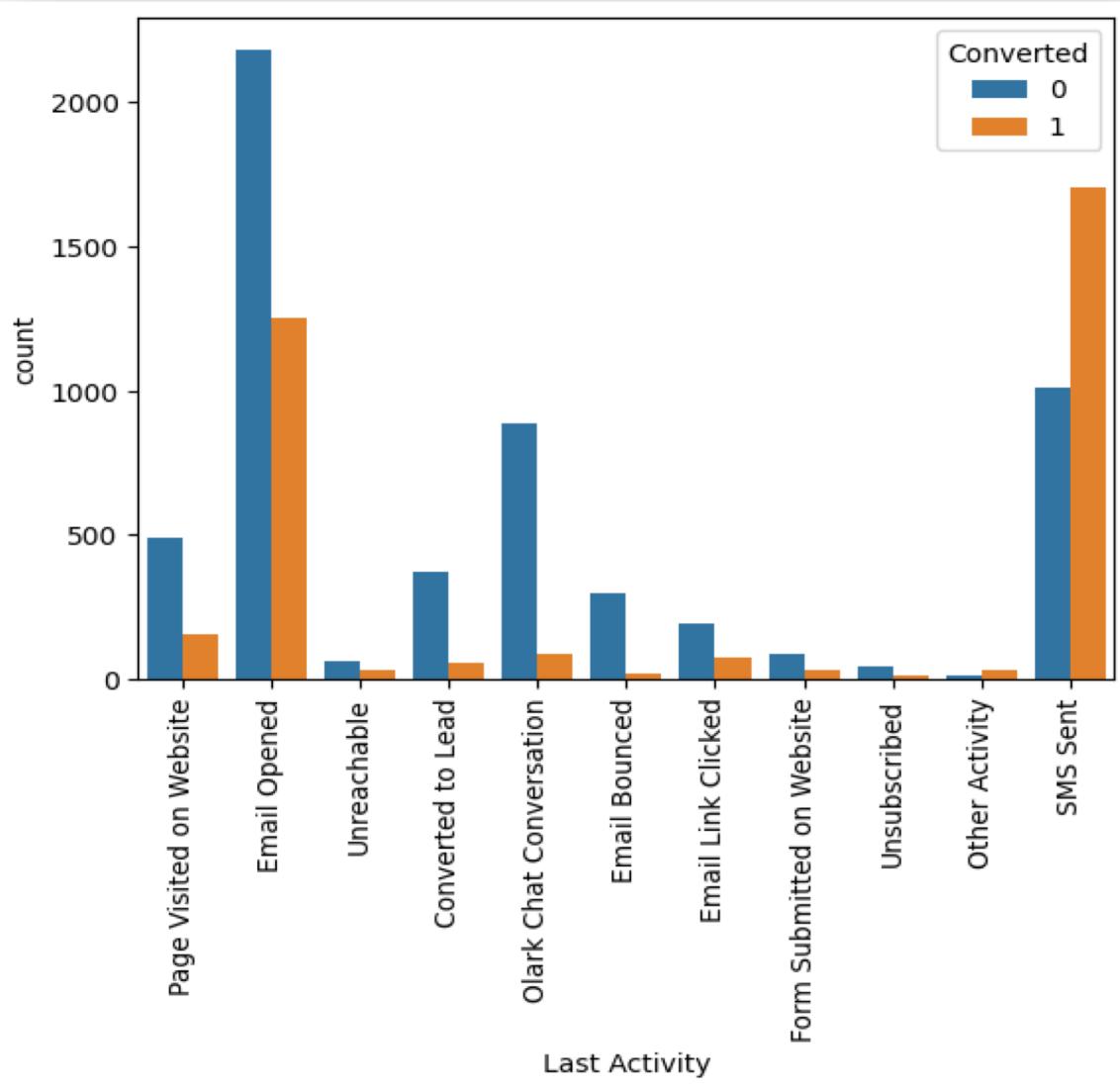
EXPLORATORY DATA ANALYSIS



TOTAL VISITS

- The median of both the conversion and non-conversion are same and hence nothing conclusive can be said using this information
- Users spending more time on the website are more likely to get converted

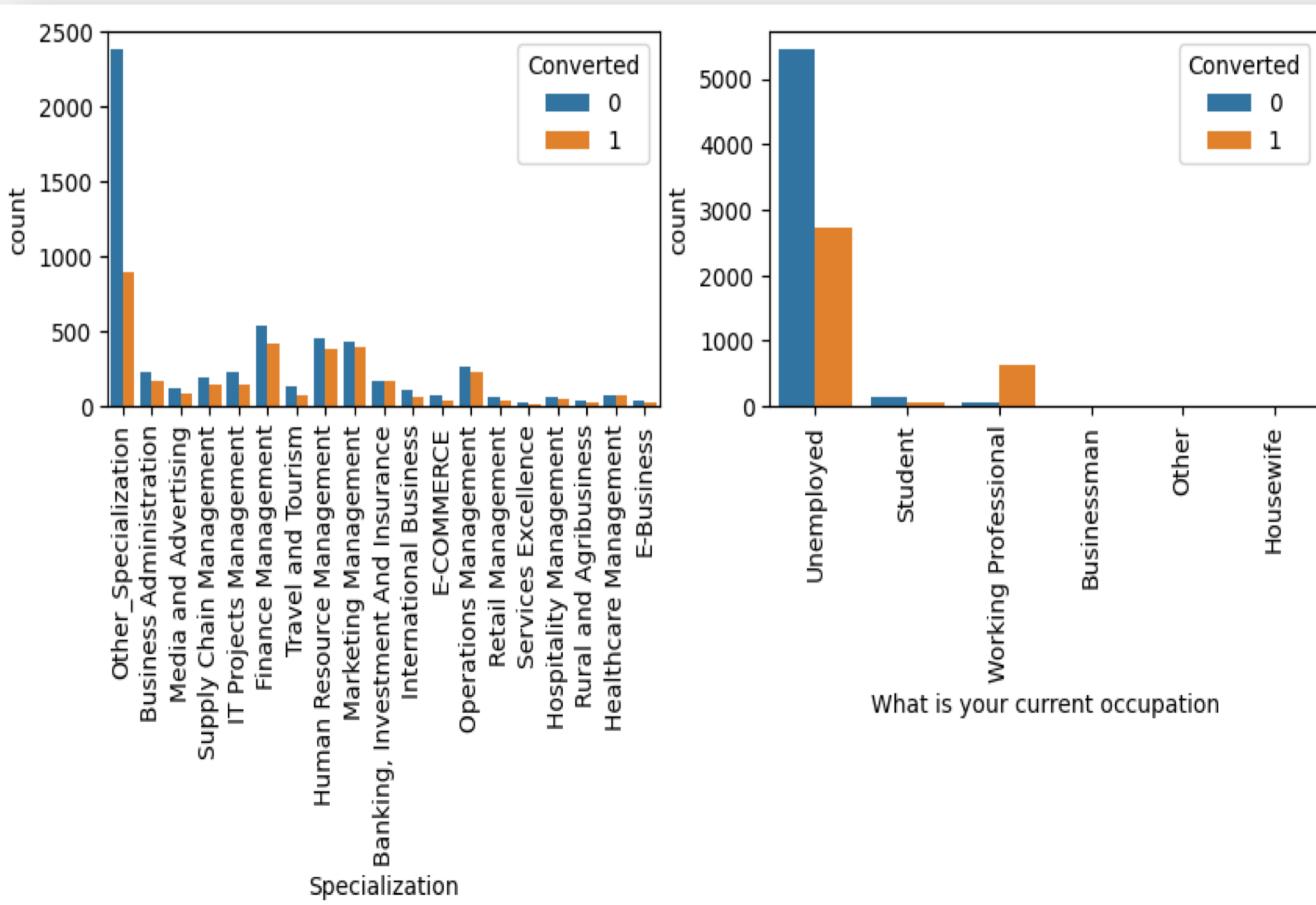
EXPLORATORY DATA ANALYSIS



LAST ACTIVITY

- The count of lead's last activity as "Email Opened" is maximum.
- The conversion rate of SMS sent as last activity is maximum

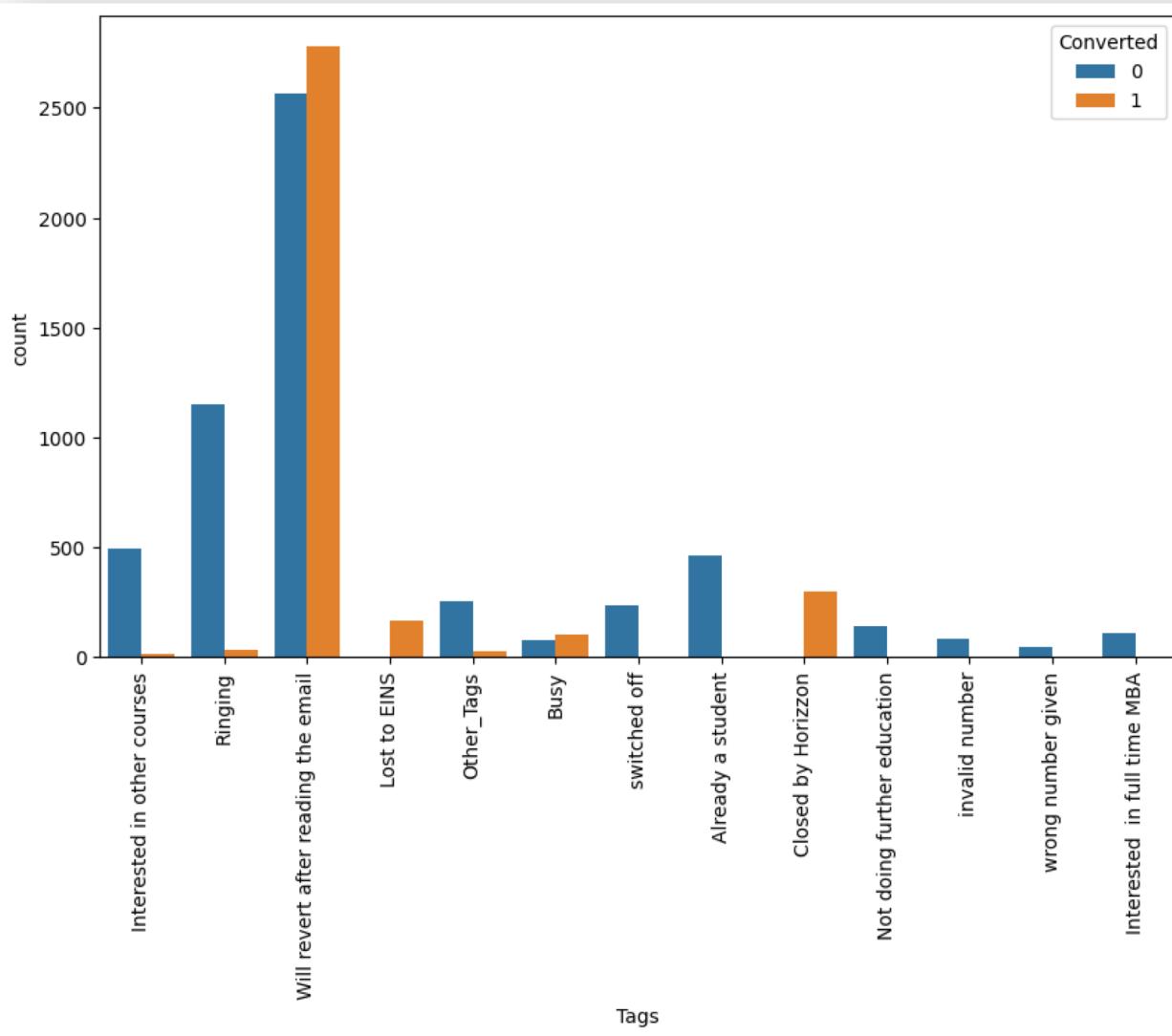
EXPLORATORY DATA ANALYSIS



SPECIALIZATION

- Looking at this plot, no particular inference can be made for Specialization.
- While, we can say that working professionals have high conversion rate.
- Number of Unemployed leads are more than any other category

EXPLORATORY DATA ANALYSIS

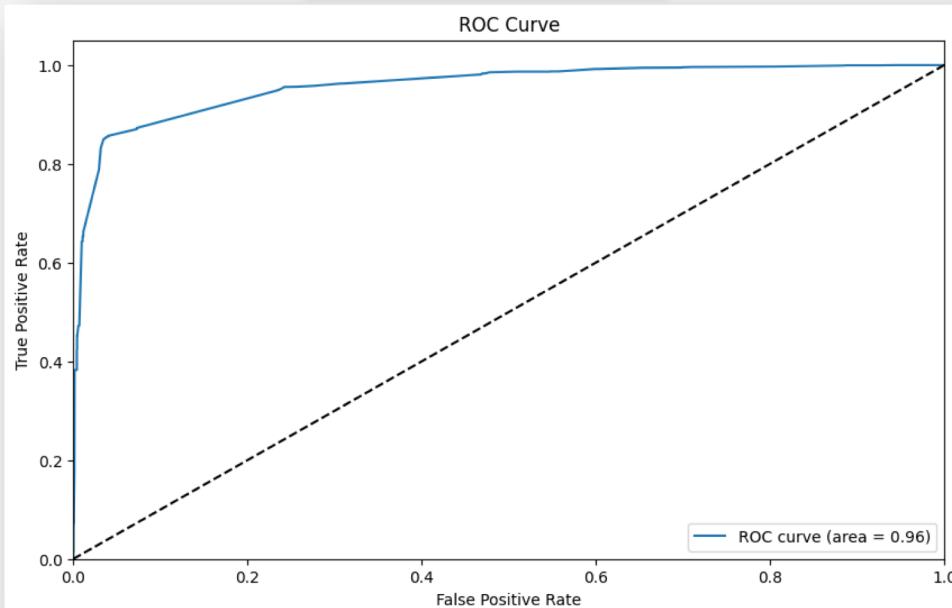


TAGS

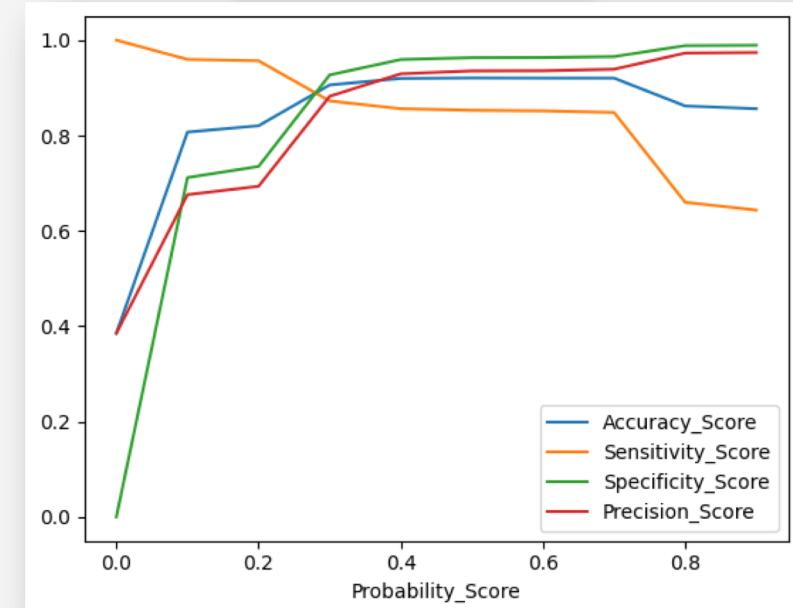
- '*Will revert after reading the email*' and '*Closed by Horizon*' has high conversion rate.

MODEL BUILDING

ROC CURVE



OPTIMAL CUT-OFF



OBSERVATIONS:

- SPLITTING THE DATA INTO TEST AND TRAINING SETS
- WE HAVE CHOSEN THE TRAIN_TEST SPLIT RATIO AS **70:30**
- USING RFE TO CHOOSE TOP 15 VARIABLES
- BUILD MODEL BY REMOVING THE VARIABLES WHOSE '**p-VALUE**' >0.05 AND '**VIF**' > 5
- PREDICTIONS ON TEST DATASET
- OVERALL ACCURACY IS **92.0 %**

MODEL EVALUATION

- CALCULATED ACCURACY, SENSITIVITY AND SPECIFICITY FOR VARIOUS PROBABILITY CUTOFFS FROM 0.1 TO 0.9
- AS PER THE GRAPH AND LOOKING AT THE OTHER SCORES, IT CAN BE SEEN THAT THE OPTIMAL POINT IS 0.27

Probability_Score	Accuracy_Score	Sensitivity_Score	Specificity_Score	Precision_Score
0.0	0.385136	1.000000	0.000000	0.385136
0.1	0.807117	0.959526	0.711652	0.675785
0.2	0.820343	0.956664	0.734955	0.693333
0.3	0.905999	0.872445	0.927017	0.882183
0.4	0.919540	0.856092	0.959283	0.929427
0.5	0.920642	0.852821	0.963124	0.935426
0.6	0.920328	0.851594	0.963380	0.935759
0.7	0.920328	0.848324	0.965429	0.938914
0.8	0.861912	0.659853	0.988476	0.972875
0.9	0.856086	0.643500	0.989245	0.974010

TRAIN DATA - CONFUSION MATRIX

ACTUAL	PREDICTED	
	NOT CONVERTED	CONVERTED
NOT CONVERTED	2987	918
CONVERTED	124	2322

ACCURACY	83.59%
PRECISION	71.6%
SENSITIVITY	94.9%
SPECIFICITY	76.5%

MODEL PREDICTION

TOP FEATURES

Feature Importance	
const	-1.248649
Do Not Email	-1.180501
Lead Origin_Lead Add Form	0.908052
Lead Source_Welingak Website	3.21816
Last Activity_SMS Sent	1.927033
Tags_Busy	3.649486
Tags_Closed by Horizon	8.555901
Tags_Lost to EINS	9.578632
Tags_Ringing	-1.771378
Tags_Will revert after reading the email	3.831727
Tags_switched off	-2.336683
Lead Quality_Not Sure	-3.479228
Lead Quality_Worst	-3.94368
Last Notable Activity_Modified	-1.682075
Last Notable Activity_Olark Chat Conversation	-1.30494

TEST DATA - CONFUSION MATRIX

ACTUAL	PREDICTED	
	NOT CONVERTED	CONVERTED
NOT CONVERTED	1303	431
CONVERTED	71	918

ACCURACY	81.5%
PRECISION	68.0%
SENSITIVITY	92.8%
SPECIFICITY	75.1%

CONCLUSION

The logistic regression model is used to predict the probability of conversion of a customer.

While we have calculated both sensitivity-specificity as well as Precision-Recall metrics, we have considered optimal cut off on the basis of sensitivity-specificity for final prediction

Lead Score calculated shows the conversion rate of final predicted model is around 92% in test data as compared to 95% in train data

In Business terms, this model has capability to adjust with the company's requirements in coming future

TOP variables that contributes for lead getting converted in the model are:

- Tags_Lost to EINS
- Tags_Closed by Horizzon
- Lead Quality_Worst

Hence Overall this model seems to be good



THANK YOU!